REMARKS/ARGUMENTS

The Office Action mailed July 12, 2004 has been reviewed and carefully considered. Claims 1-7 have been amended. Claims 1-7 are pending in this application, with claim 1 being the only independent claim. Reconsideration of the above-identified application, as herein amended and in view of the following remarks, is respectfully requested.

Information Disclosure Statement

An Information Disclosure Statement was filed on September 2, 2004, after the issuance of the Final Office Action mailed on July 12, 2004. Consideration of the Information Disclosure Statement is respectfully requested.

Response to rejections under 35 U.S.C. §102

In the Office Action mailed July 12, 2004, claims 1-7 stand rejected under 35 U.S.C. §102(b) as anticipated by U.S. Patent No. 6,459,680 (Alperovich).

Before discussing the cited prior art and the Examiner's rejections of the claims in view of that art, a brief summary of the present invention is appropriate. The present invention relates to the allocation of a temporary mobile identifier for a mobile station by a controlling radio network controller. As described in the specification, third generation cellular networks typically comprise a core network 50 connected to one or more radio access networks (RANs) 40 (see page 2, lines 10-12 of the specification). The RANs include a plurality of base stations 20a, 20b, 20c for effecting radio connections to mobile stations 10a, 10b and at least one radio network controller (RNC) 20 for controlling the base stations (page 2, lines 14-17). The RNCs 30 are connected to a Mobile Switching Center (MSC) 60 in the core network (page 2, lines 17-18).

The specification further explains that more than one RNC may be involved with connections of a single mobile station (page 2, lines 19-20). The specification describes an example

in which a mobile station is initially controlled by base station 20a and RNC 30a and later moves to a base station 20b, wherein the connection goes from MSC 60 through initial RNC 30a to RNC 30b and finally to base station 20b (page 2, lines 20-26). In this situation, the initial RNC 30a is called the serving RNC (SRNC) and the second RNC is called the controlling RNC (CRNC) (page 2, lines 27-29). Temporary identifiers called Radio Network Temporary Identifiers (RNTI) are used as user equipment (UE) identifiers (page 3, lines 5-9). The RNTI identifiers are used and defined by the RNCs (page 3, line 9). The CRNC and SRNC each allocate their own temporary identifiers, i.e., cRNTI and sRNTI (page 3, lines 9-14). The present invention address the problem of informing the UE of the cRNTI allocated by the controlling RNC, which problem is unique to third generation cellular systems.

Independent claim 1 has been amended to put the claims in the more customary format according to U.S. Patent practice of using a gerund form of the verb and to remove the reference characters from the claims. Accordingly, the amendment is not the type that requires further search and consideration.

It is respectfully submitted that Alperovich fails to disclose the step of "allocating, <u>by a controlling radio network controller</u>, a temporary mobile station identifier for a mobile station if the network determines that a state change to the second state is needed". Alperovich relates to the optimal use of a logical channel in a GSM network (see, e.g., col. 4, lines 7-9, and col. 5, lines 55-56 in Alperovich). In contrast to the present invention, Alperovich discloses that a Temporary Mobile Subscriber Identity (TMSI) is assigned by a <u>serving MSC</u> (see col. 6, lines 32-37). The Examiner states that Fig. 5, element 50 and the associated description disclose the step of allocating a temporary subscriber identity, by the controlling radio network controller. However, element 50 in Alperovich is the MSC. Attachment 1 to this amendment is an excerpt from Mouly,

M. and Pautet, M., *The GSM System for Mobile Communications*, Cell & Sys. Correspondence, 1992, pages 94-104, and discloses that the MSC is part of Network and Switching Sub-System (NSS) in a GSM network and is therefore <u>not</u> part of the base station sub-system (BSS) or radio cellular aspects of the system. Since the MSC is not part of the Radio Access Network, the MSC can <u>not</u> be considered to be a controlling radio network controller, as recited in independent claim 1.

Furthermore, Alperovich fails to distinguish between a controlling radio network controller and a serving radio network controller, as defined on page 2, lines 27-29 of the present specification. As stated in MPEP §2131, a claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Bros. V. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Since Alperovich discloses that the MSC in the core network allocates a TMSI for the mobile terminal, Alperovich fails to disclose, teach or suggest that the <u>controlling radio network controller</u>, or any other radio network controller, allocates a temporary mobile station identifier for a mobile station. In view of the above remarks, independent claim 1 is <u>not</u> anticipated by Alperovich under 35 U.S.C. §102.

Since Alperovich relates to GSM networks, there is also no teaching or suggestion that a <u>controlling radio network controller</u> allocates a temporary mobile station identifier. As disclosed in the specification, the allocation of temporary identifiers by the radio network controllers is performed in third generation cellular networks. In contrast, Alperovich discloses that a TMSI is assigned or allocated by an MSC in accordance with GSM specifications. Since Alperovich fails to teach that the RNCs allocate temporary IDs to the mobile terminals (i.e., UEs), Alperovich fails to provide a solution to the problem addressed by the present invention of

informing the UE of the cRNTI allocated by the controlling RNC. In view of the above remarks, independent claim 1 is also allowable over Alperovich under 35 U.S.C. §103.

Dependent claims 2-7, being dependent on independent claim 1, are deemed allowable for the same reasons expressed above with respect to independent claim 1.

The application is now deemed to be in condition for allowance and notice to that effect is solicited.

It is believed that no fees or charges are required at this time in connection with the present application. However, if any fees or charges are required at this time, they may be charged to our Patent and Trademark Office Deposit Account No. 03-2412.

Respectfully submitted,

COHEN, PONTANI, LIEBERMAN & PAVANE

By Alfred W. Froebrich

Alfred W. Froebrich
Reg. No. 38,887
551 Fifth Avenue, Suite 1210
New York, New York 10176
(212) 687-2770

Dated: October 12, 2004

Attachment 1 page (1 of 13)

The GSM System for Mobile Communications

Michel MOULY
Marie-Bernadette PAUTET

Attachment 1 (page 2 of 13)

This book is published by the author's company, Cell & Sys. Correspondence, in particular for the orders, but also for comments, should be mailed to:

CELL & SYS
4, rue Elisée Reclus
F-91120 PALAISEAU
FRANCE

Telephone : + 33 1 69 31 03 18

Facsimile : + 33 1 69 31 03 38

Web site : http :/ /perso.wanadoo.fr/cell.sys/

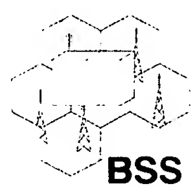
International Standard Book Number: 2-9507190-0-7

Attachment 1 (page 3 of 13)

equipment choice. The last steps of the SIM personalisation can be done easily through a small computer and a simple adapter. Mobile equipment will be for sale on a much larger-scale than ever before, since their acquisition will not require the intervention of an operator or a service provider. Car phones will still require installation in the vehicle, but portables or handhelds will encourage users to buy their mobile equipment from any store.

More advantages can be envisaged. For instance, rented cars could be equipped with a mobile equipment usable with any SIM, whether user-owned or also rented. The reverse situation may also bring benefit to subscribers, if not to operators: a subscriber may change his serving operator without replacing his ME. But most of all, as explained in Chapter 1, this personal chip secured in its plastic case and called SIM is the first brick in the building of a personal communication system enabling wide-ranging mobility between different telecommunications networks.

2.1.2. THE BASE STATION SUB-SYSTEM (BSS)



Largely speaking, the Base Station Subsystem groups the infrastructure machines which are specific to the radio cellular aspects of GSM. The BSS is in direct contact with mobile stations through the radio interface. As such, it includes the machines in charge of transmission and reception on the radio path, and the management thereof. On the other side, the BSS is in contact with the switches of the NSS. The role of the BSS can be summarised as to connect the mobile station and the NSS, and hence the mobile station's user with other telecommunications users. The BSS has to be controlled and is thus also in contact with the OSS. The external interfaces of the BSS are summarised in figure 2.8.

According to the canonical GSM architecture, the BSS includes two types of machines: the BTS (Base Transceiver Station), in contact with the mobile stations through the radio interface, and the BSC (Base Station Controller), the latter being in contact with the switches of the NSS. The functional split is basically between a transmission equipment, the BTS, and a managing equipment, the BSC.

M personalisation can be done
ole adapter. Mobile equipment
than ever before, since their
on of an operator or a service
installation in the vehicle, but
users to buy their mobile

For instance, rented cars could
e with any SIM, whether user-
on may also bring benefit to
iber may change his serving
most of all, as explained in
plastic case and called SIM is
sonal communication system
different telecommunications

:-SYSTEM (BSS)

ase Station Subsystem groups
nes which are specific to the
GSM. The BSS is in direct
ons through the radio interface.
the machines in charge of
on on the radio path, and the
he BSS is in contact with the
SS can be summarised as to
and hence the mobile station's
The BSS has to be controlled
The external interfaces of the

architecture, the BSS includes
ransceiver Station), in contact
interface, and the BSC (Base
ntact with the switches of the
veen a transmission equipment,
SC.

Attachment I (page 4 of 13)

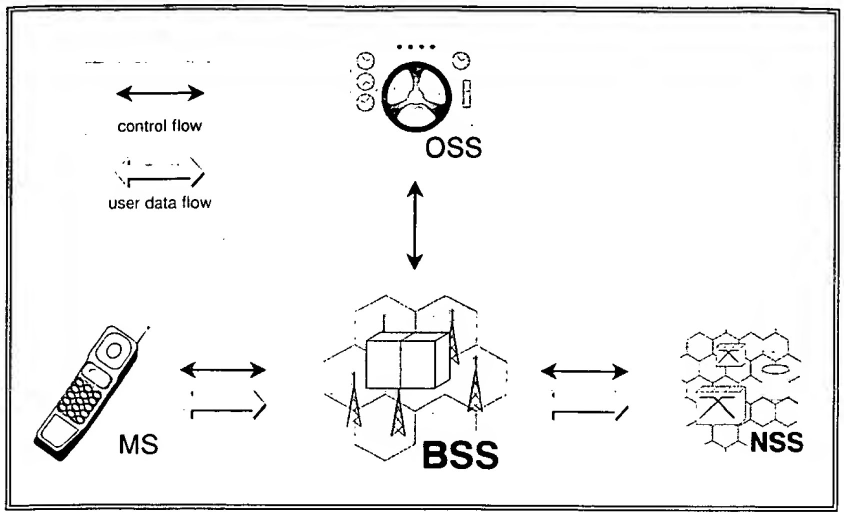
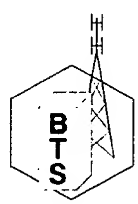


Figure 2.8 – The external environment of the BSS

The BSS bridges the space between the mobile stations on one side (through the radio interface), and the switching functions on the other. It is controlled by the operator through the OSS.



A BTS comprises radio transmission and reception devices, up to and including the antennas, and also all the signal processing specific to the radio interface. BTSs can be considered as complex radio modems, and have little other function. A typical first-generation BTS consists of a few racks (2m high and 80 cm wide) containing all electronic devices necessary for the transmission functions, as shown in figure 2.9 for a GSM900 BTS and figure 2.10 for a DCS1800 BTS. The antennas are usually a few tens of meters away, on a mast, and the racks are connected to it through a feeder cable. A one-rack first-generation BTS is typically able to handle three to five radio carriers, carrying between 20 and 40 simultaneous communications. Reducing the BTS volume is important to keep down the cost of the cell sites, and progress can be expected in this area.

An important component of the BSS, which is considered in the canonical GSM architecture as a part of the BTS, is the TRAU, or Transcoder/Rate Adapter Unit. The TRAU is the equipment in which the GSM-specific speech encoding and decoding is carried out, as well as the rate adaptation in case of data. Although the *Specifications* consider the

Attachment 1 (page 5 of 13)

Figure 2.9 – A GSM BTS (by courtesy of Motorola)

A one-rack BTS, such as the one shown, is typically able to handle up to 5 carriers. The picture shows the rack equipped for 3 carriers.

TRAU as a sub-part of the BTS, it can be sited away from the BTS, and even more so since in many cases it is actually between the BSC and the MSC. Its remote position allows the advantage of more compressed transmission between BTS and TRAU, and its impact will be discussed in detail in Chapter 3.

· of Motorola)

.ble to handle up to 5 carriers.
for 3 carriers.

d away from the BTS, and
/ between the BSC and the
tage of more compressed
impact will be discussed in

Attachment 1 (page 6 of 13)

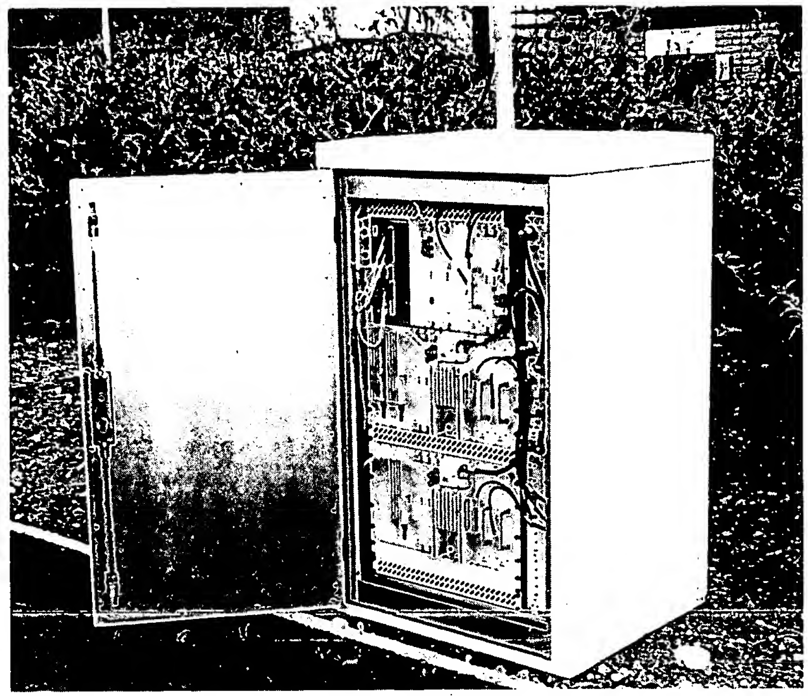
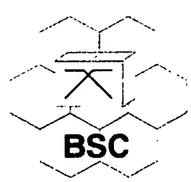


Figure 2.10 - A DCS1800 BTS (by courtesy of Nokia)

The small rack shown is designed to be used outside, typically below the antenna mast.



The internal structure of the BSS is represented in figure 2.11. On top of the BTS, it shows the second "canonical" component of the BSS, the BSC. The BSC is in charge of all the radio interface management through the remote command of the BTS and the MS, mainly the allocation and release of radio channels and the handover management. The BSC is connected, on one side, to several BTSs and on the other side, to the NSS (more exactly to an MSC).

A BSC is in fact a small switch with a substantial computational capability. Its main roles are the management of the channels on the radio interface, and of the handovers. A typical BSC consists of one or two racks, as shown in figure 2.12 and can manage up to some tens of BTSs, depending on their traffic capacity.

Attachment 1 (page 7 of 13)

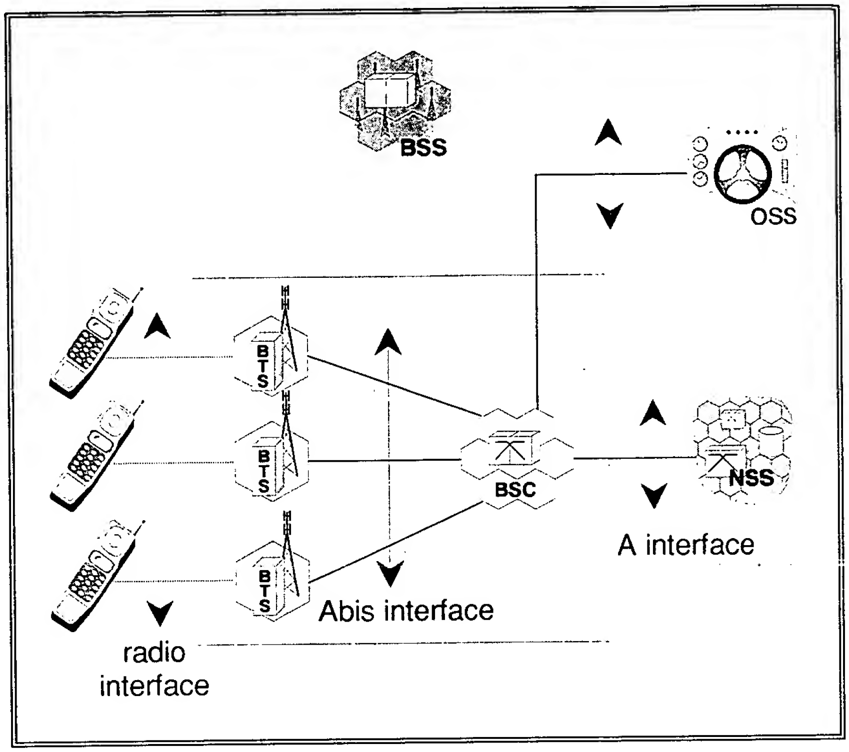
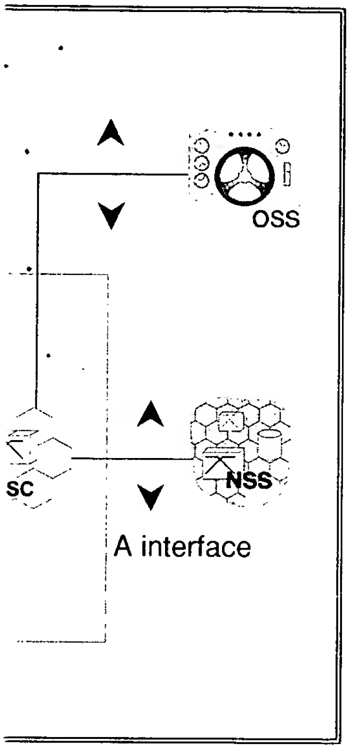


Figure 2.11 – BSS components and interfaces

The Base Station Sub-system consists of BTSs, situated on the antenna sites, and of BSCs, each one in control of several BTSs.

The concept of the interface between BSC and MSC, called the A interface, was introduced fairly early in the GSM standard elaboration process. Only later was it decided to also standardise the interface between BTS and BSC, and this interface therefore bears the (not any more meaningful than A!) name of "Abis" interface.

In the GSM vocabulary, *a* BSS means the set of one BSC and all the BTSs under its control, not to be confused with *the* BSS as the sub-system including all the BSCs and BTSs.



and interfaces

situated on the antenna sites,
of several BTSs.

BSC and MSC, called the A
e GSM standard elaboration
so standardise the interface
therefore bears the (not any
iterface.

is the set of one BSC and all
sed with *the* BSS as the sub-

Attachment 1 (page 8 of 13)

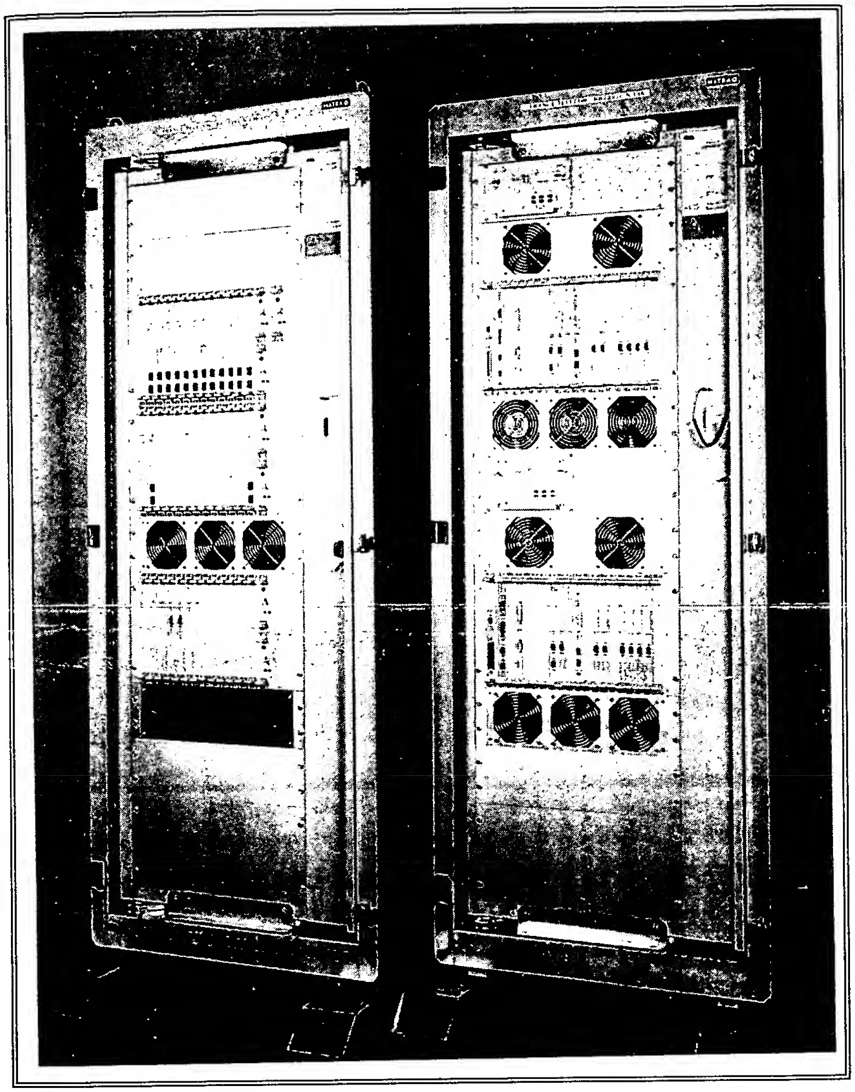
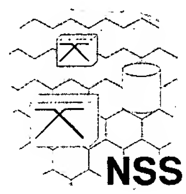


Figure 2.12 – A GSM BSC (by courtesy of Matra Communication)

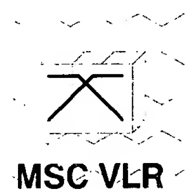
The BSC shown here consists of two cabinets:
a control cabinet holding the duplicated central control and switching functions,
and a cabinet handling the interfaces.

Attachment 1 (page 9 of 13)

2.1.3. THE NETWORK AND SWITCHING SUB-SYSTEM (NSS)



The Network and Switching Sub-system, or NSS, includes the main switching functions of GSM, as well as the data bases needed for subscriber data and mobility management. It is also sometimes called the switching sub-system, which is indeed more appropriate since a GSM network includes the BSS as well as the NSS. The main role of the NSS is to manage the communications between the GSM users and other telecommunications network users.



Within the NSS, the basic switching function is performed by the MSC (Mobile services Switching Centre), whose main function is to co-ordinate the setting-up of calls to and from GSM users. The MSC has interfaces with the BSS on one side (through which it is in contact with GSM users), and with the external networks on the other. The interface with external networks for communication with users outside GSM may require a

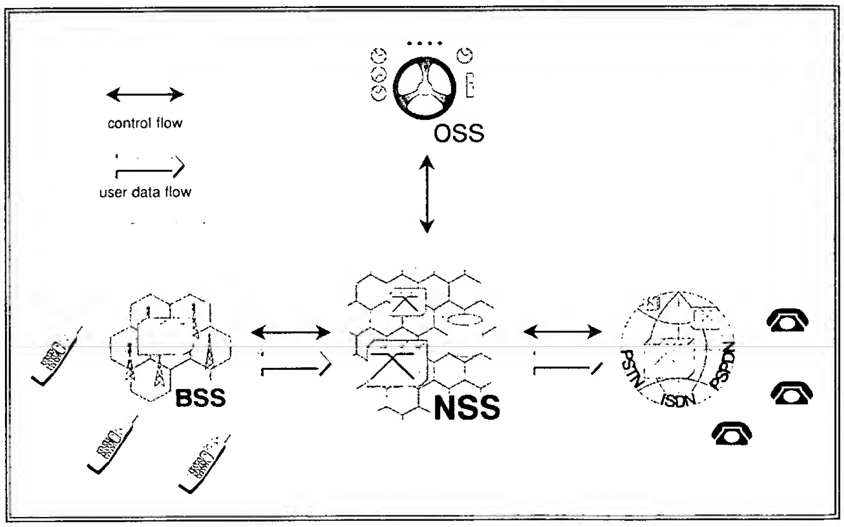


Figure 2.13 – The external environment of the NSS

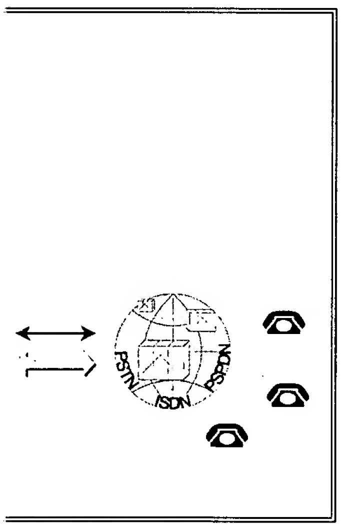
The NSS, through its MSC, is in contact with the BSS and external networks.
Like the BSS, it is controlled by the operator through the OSS.
NSS entities are also in contact with NSS entities of other GSM networks
for the exchange of data through SS7 signalling networks.

Attachment 1 (page 10 of 13)

ГCHING SUB-SYSTEM

:hing Sub-system, or NSS, ıg functions of GSM, as well ːd for subscriber data and is also sometimes called the which is indeed more network includes the BSS as role of the NSS is to manage GSM users and other

ıasic switching function is (Mobile services Switching ıction is to co-ordinate the from GSM users. The MSC S on one side (through which users), and with the external The interface with external ıutside GSM may require a



ɴent of the NSS

ː BSS and external networks.
ator through the OSS.
ies of other GSM networks
ignalling networks.

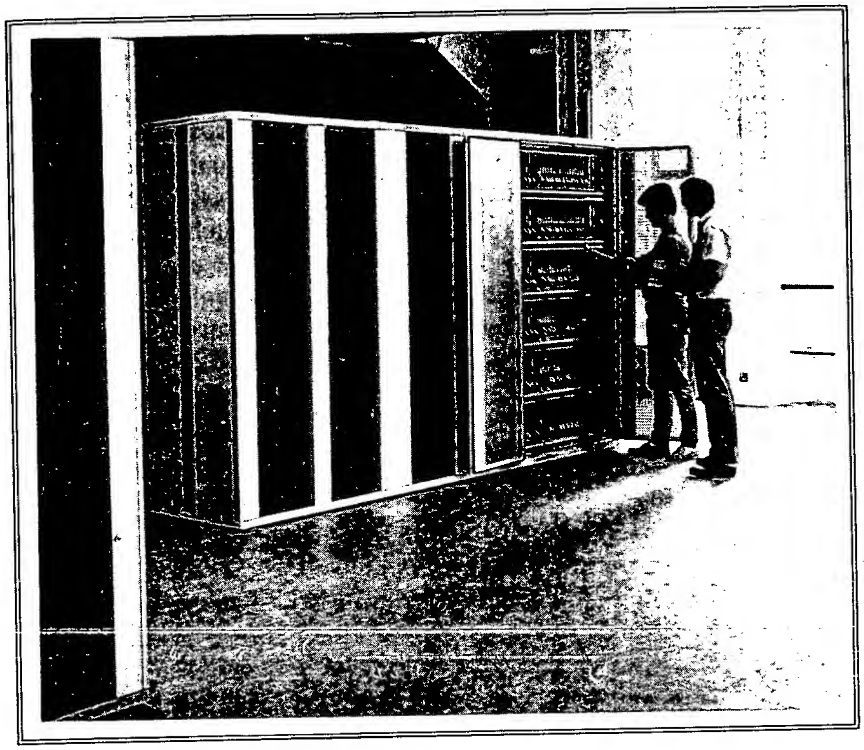


Figure 2.14 – A GSM MSC (by courtesy of Matra Ericsson Telecommunications)

An MSC includes several rows of cabinets, one of which is shown here.

gateway for adaptation (Interworking Functions, or IWF), the role of which may be more or less substantial depending on the type of user data and the network it interfaces with. The NSS also needs to interface external networks to make use of their capability to transport user data or signalling between GSM entities. In particular, the NSS makes use of a signalling support network, at least partly external to GSM, following the CCITT Signalling System n°7 protocols (and therefore usually referred to as the SS7 network); this signalling network enables co-operative interworking between NSS machines within one or several GSM networks. The external interfaces of the NSS are represented schematically in figure 2.13.

As a piece of equipment, an MSC controls a few BSCs and is usually a rather big switching machine. With a medium population penetration percentage, a typical MSC at the date of writing is suitable for covering a regional capital and its surroundings, totalling say 1 million inhabitants. Such an MSC includes about half a dozen racks. Figure 2.14 shows a GSM MSC.

Attachment 1 (page 11 of 13)

The interconnection of the MSC with certain networks requires the adaptation of the GSM transmission peculiarities to those of the partner network. These adaptations are the Interworking Functions (IWF). This term refers by extension to the functional entity in charge of them. It basically consists of a transmission and protocol adaptation equipment. It enables interconnection with networks such as PSPDNs (Packet-Switched Public Data Networks) or CSPDNs (Circuit-Switched Public Data Networks), but it also exists when the partner network is simply the PSTN or the ISDN. Interworking functions may be implemented together with the MSC function, or they may be performed by a separate equipment. In the second case, the interface between MSC and IWF is left open by the *Specifications*.

Besides MSCs, the NSS includes data bases. Subscriber information relevant to the provision of telecommunications services is held on the infrastructure side in the HLR (Home Location Register), independently of the actual location of the subscriber. The HLR also includes some information related to the current location of the subscriber. As a physical machine, an HLR is typically a standalone computer, without switching capabilities, and able to handle hundreds of thousands of subscribers. A functional subdivision of the HLR identifies the Authentication Centre, or AuC, the role of which is limited to the management of security data for the authentication of subscribers.

The second database function identified in GSM is the VLR (Visitors Location Register), linked to one or more MSCs, and in charge of temporarily storing subscription data for those subscribers currently situated in the service area of the corresponding MSC(s), as well as holding data on their location at a more precise level than the HLR. In current practice, as will be explained in more detail in Chapter 7, a VLR function is always integrated with each MSC.

certain networks requires the
arities to those of the partner
rking Functions (IWF). This
entity in charge of them. It
tocol adaptation equipment. It
as PSPDNs (Packet-Switched
ircuit-Switched Public Data
artner network is simply the
may be implemented together
e performed by a separate
e between MSC and IWF is

ncludes data bases. Subscriber
to the provision of
vices is held on the
he HLR (Home Location
of the actual location of the
includes some information
ation of the subscriber. As a
tandalone computer, without
hundreds of thousands of
f the HLR identifies the
of which is limited to the
ication of subscribers.

tified in GSM is the VLR
r more MSCs, and in charge
r those subscribers currently
onding MSC(s), as well as
ecise level than the HLR. In
re detail in Chapter 7, a VLR
.

Attachment 1 (page 12 of 13)

But the NSS contains more than MSCs, VLRs and HLRs. In order to set up a call towards a GSM user, this call is first routed to a gateway switch, referred to as GMSC, without any knowledge of the whereabouts of the subscriber. The gateway switches are in charge of fetching the location information and of routing the call towards the MSC through which the subscriber can obtain service at this instant (the Visited MSC). To do this, they must first find the right HLR, knowing only the directory number of the GSM subscriber, and interrogate it. The gateway switch has an interface with external networks for which it provides gatewaying as well as with the SS7 signalling network to interwork with other NSS entities. The term GMSC is somewhat misleading, because the GMSC function is not by technical necessity linked to an MSC. It could be thought of as an independent equipment, or as a function integrated in a digital telephony switch. However, charging considerations explained in detail in Chapter 8 are such that gateway functions will not for some time be set outside GSM networks, and economic considerations make it undesirable to have standalone machines for this function. This state of things results in the widespread implementation of the GMSC function in the same machines as the MSC function itself.

Having seen the pieces, let us look at the glue. Depending upon national regulations, a GSM operator may or may not be allowed to operate the full SS7 network between NSS machines. If the GSM operator has the full control of this signalling network, then Signalling Transfer Points (STPs) will probably be part of the NSS functions, and could be implemented either as stand-alone nodes or in the same machines as the MSCs, in order to optimise the cost of the signalling transport between NSS entities (MSC/VLRs, GMSCs, HLRs, ...).

Similarly, depending upon the terms of its license, a GSM operator may have the right to implement its own network for routing calls between GMSC and MSC, or even for routing outgoing calls as near as possible to the destination point before using the fixed network. In this case, Transit Exchanges (TE, not to be confused with "Terminal

Attachment 1 (page 13 of 13)

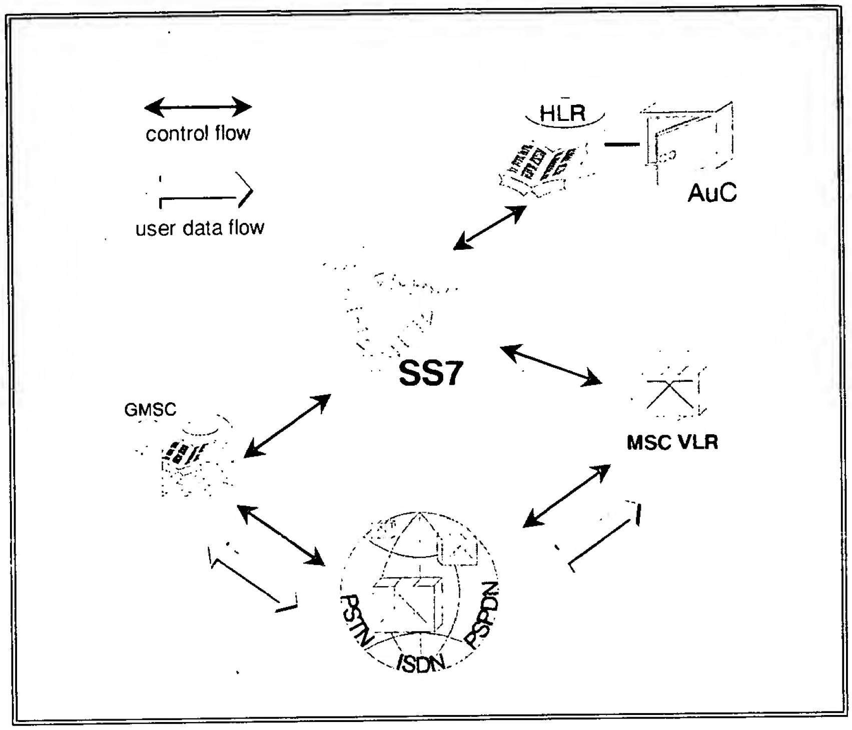


Figure 2.15 – Internal structure of the NSS

Beside switches such as the MSCs and GMSCs, linked between themselves through a fixed network structure which may or may not be part of the GSM network, the NSS includes databases (such as the HLR/AuC) interconnected through an SS7 signalling support network. This picture shows the case when the VLR database is integrated with the MSC.

Equipment" as used for the mobile station architecture) may be part of the GSM network as well, and there again may be implemented as stand-alone nodes or together with some MSCs.

As a summary, figure 2.15 shows the main components of a GSM NSS and the interconnections between them.